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(56) Documents Cited

EP 0852191 A1

EP 0800956 A1

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Online WPI, EPODOC, JAPIO

(54) Abstract Title

A handle assembly for a motor vehicle

(57) A handle assembly (10) for a motor vehicle having a handle (11) secured to a part of a body construction (9a, 9b) of the motor vehicle by means of two U-shaped brackets (14, 15) designed to collapse in a predetermined manner when an impact load is applied to the handle (11). A rigid member (31a, 31b) is interposed between each of the brackets (14, 15) and the handle (11) so as to distribute any load transferred from the handle (11) to the brackets (14, 15) thereby preventing localised distortion of each of the brackets (14, 15) in the region where they are connected to the handle (11).

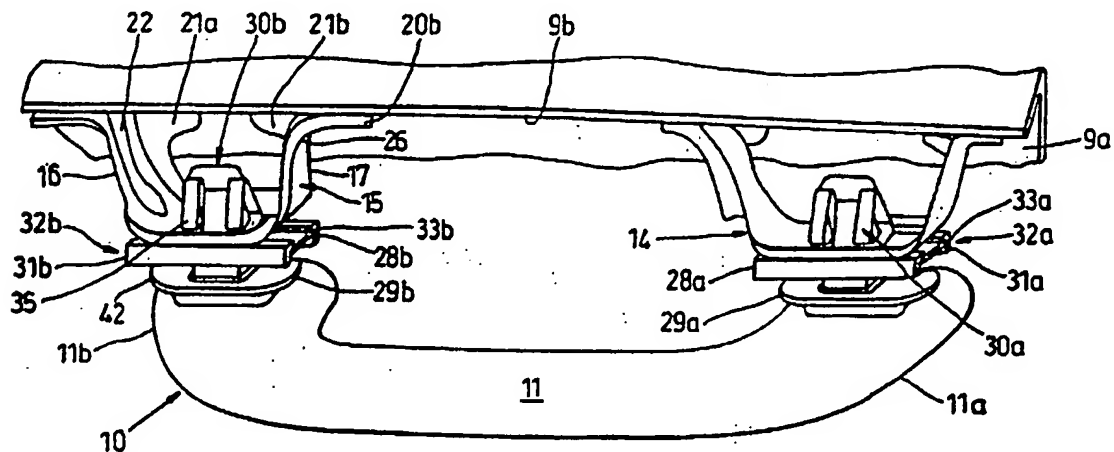


Fig. 3

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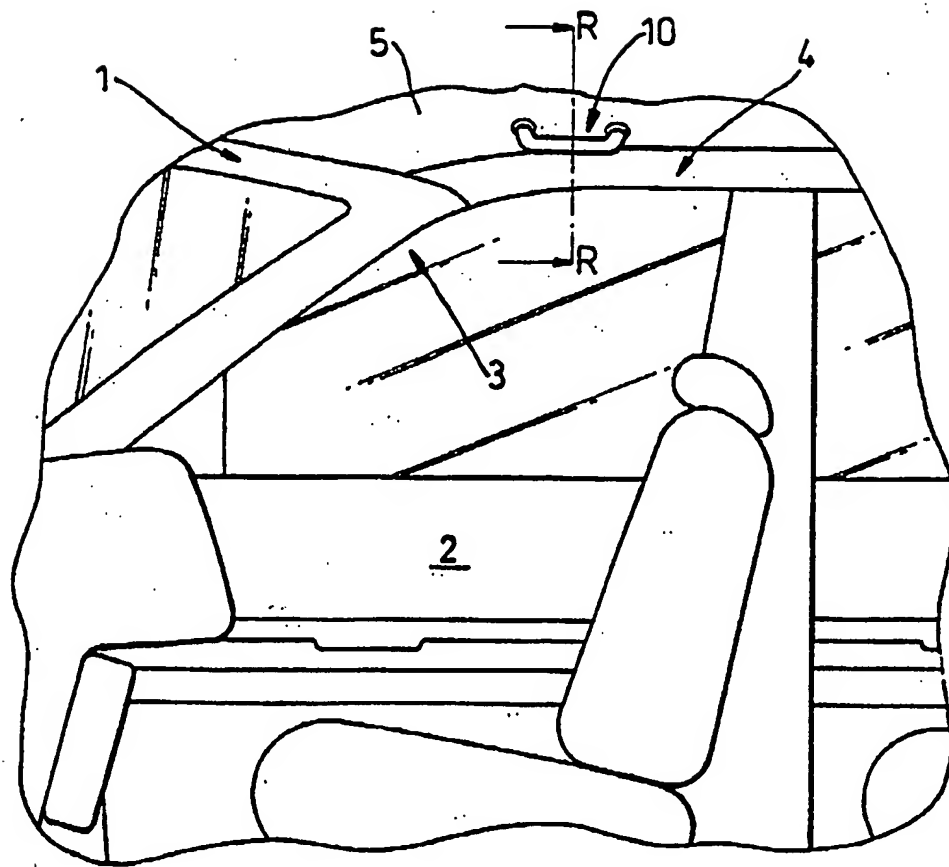


Fig. 1

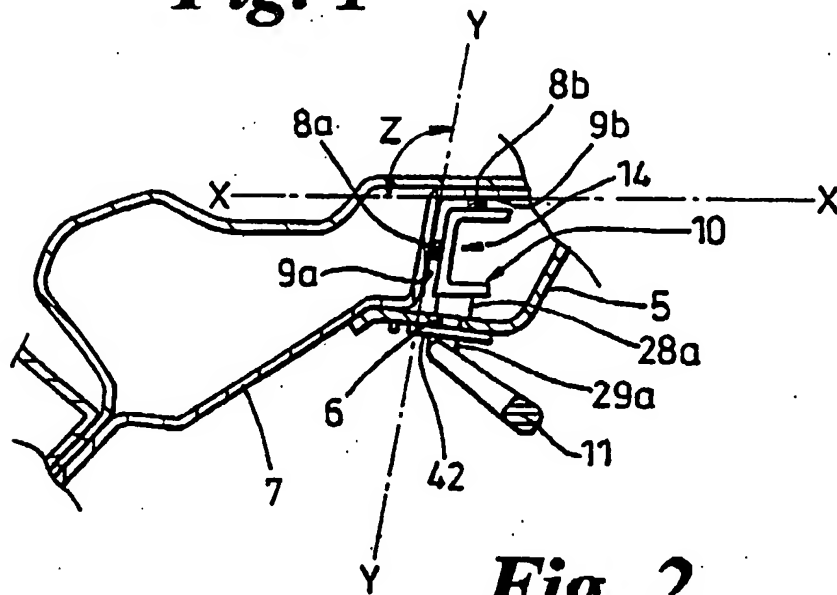


Fig 2

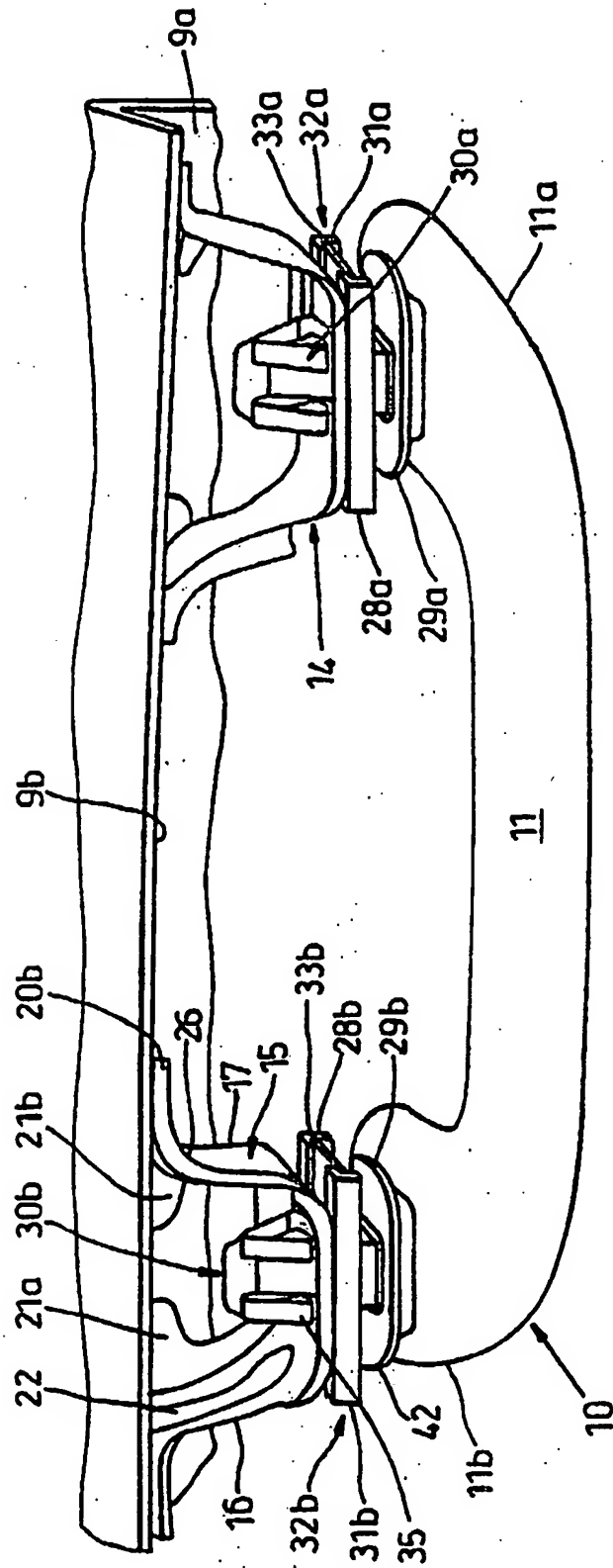


Fig. 3

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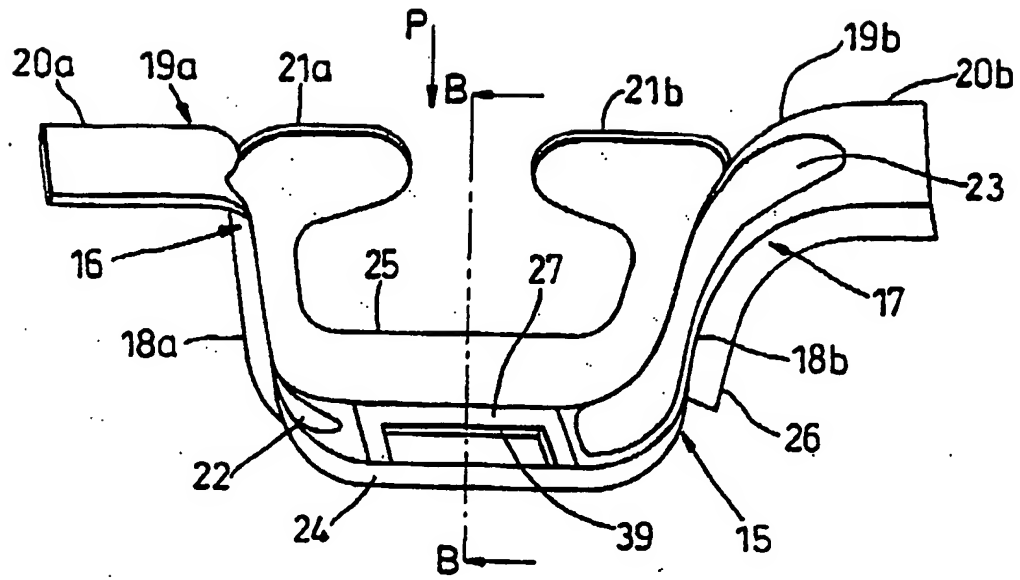


Fig. 4

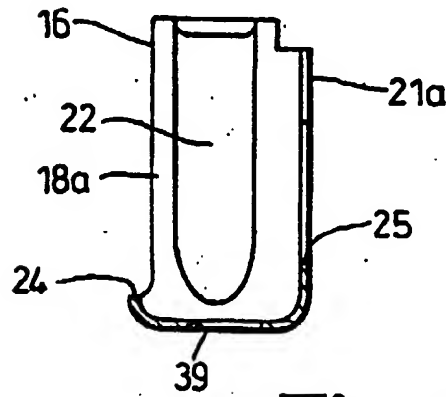


Fig. 5

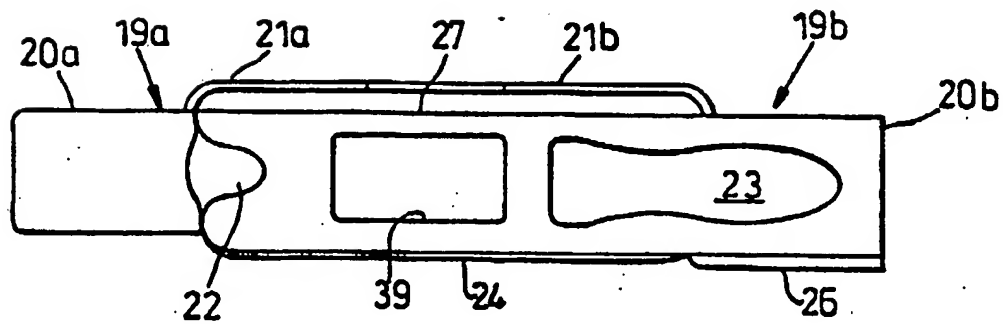


Fig. 6

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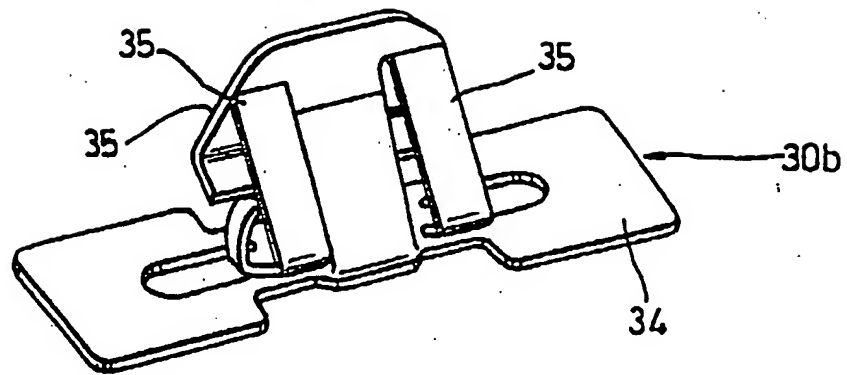


Fig. 7

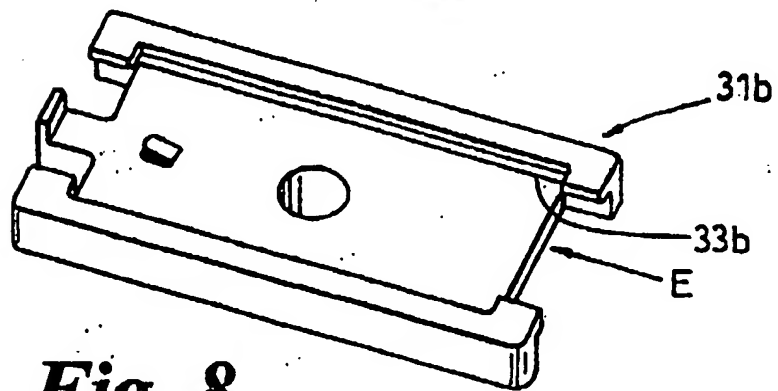


Fig. 8

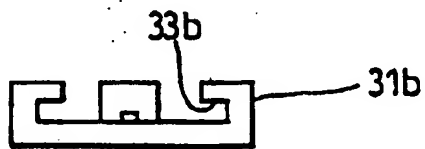


Fig. 9

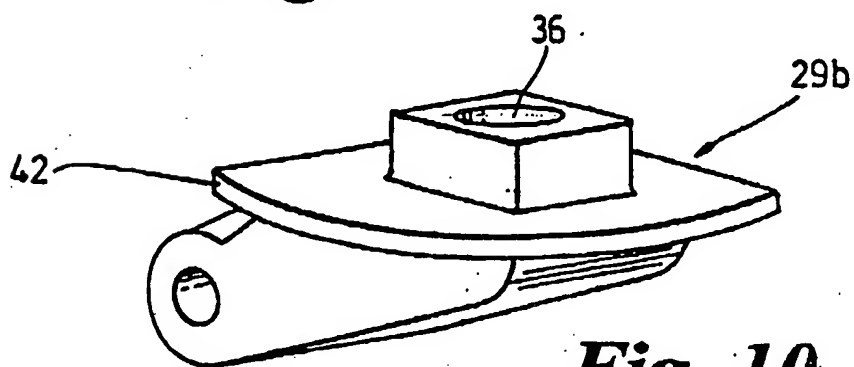
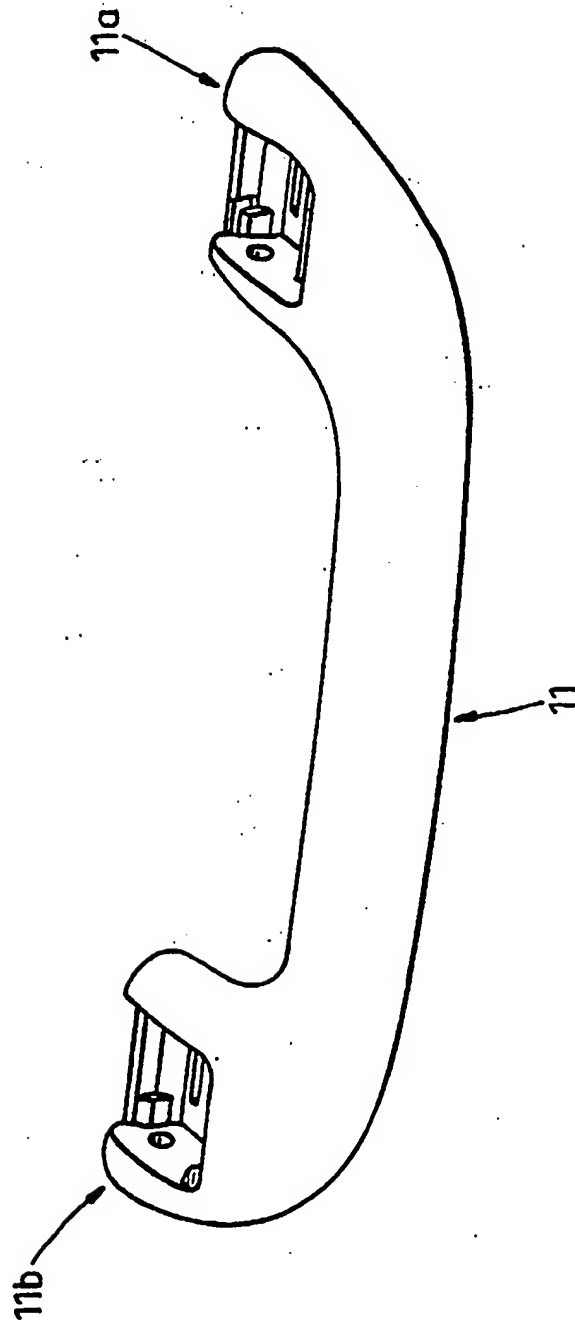
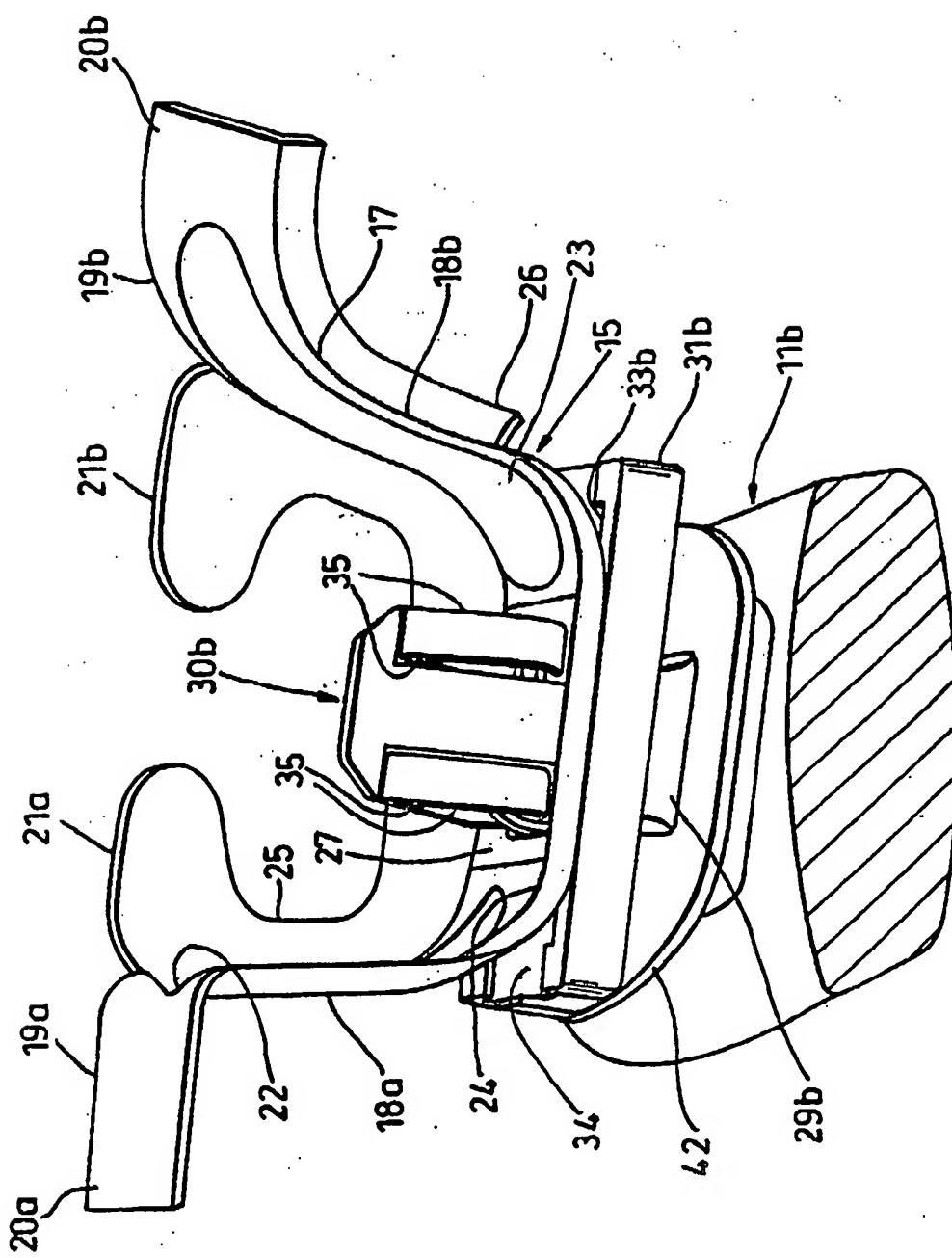


Fig. 10

**Fig. 11**

**Fig. 12**

A Handle Assembly

The invention relates to a handle assembly and in particular to a handle assembly for mounting in a motor vehicle to assist with ingress and egress from the motor vehicle.

Description of Background Art.

5 It is known to provide a handle assembly to aid the ingress and egress of a person from a motor vehicle. Such a handle is often referred to as a grab handle and is normally mounted adjacent to and above a vehicle door aperture. Such grab handles are typically mounted through a fixing secured to part of the body structure of the motor vehicle located adjacent to the vehicle door aperture such that they are able to resist
10 dislocation as an occupant exits or enters the vehicle. Such a prior art fixing is shown in US patent number 4,357,734.

Not only must the handle assembly be able to resist the loads exerted upon it by a person using the handle it must also be able to provide energy absorption if impacted upon by the head of an occupant of the motor vehicle if the motor vehicle is involved in
15 an accident. Various safety regulations have to be complied with and in particular European upper environment impact tests ECE 21 and American Federal interior head impact test FMVSS210 must be satisfactorily passed.

A rigid fixing means as shown in the prior art patent provides little energy absorption in the case of an impact with the head of an occupant and is unlikely to pass
20 these tests.

In addition, it is now becoming increasingly common to use head impact airbags to minimise the risk of head injuries in the event of an accident. Such head impact airbags require a relatively large storage space in the area above and adjacent to the

door aperture. This makes the packaging of the fixing means for the handle assembly very difficult when such a head impact airbag is fitted.

Object of the Invention

It is an object of the present invention to provide a handle assembly for a motor
5 vehicle that has good energy absorption properties and can be more readily used in association with a head impact airbag.

Summary of Invention

In accordance with the invention there is provided a handle assembly for securing to part of a body structure of a motor vehicle for assisting the ingress and egress of a
10 person entering or exiting the motor vehicle comprising a handle having first and second ends, first and second brackets securable to the body structure to space the handle away from said body structure, a first connecting means to connect the first end of the handle to said first bracket and a second connecting means to connect the second end of the handle to the second bracket wherein each of said first and second
15 brackets is substantially U-shaped having two arms connected by a central portion, each arm having a deformable section arranged to collapse in a controlled manner upon the application of an impact load to the handle.

Advantageously, at least one of the arms has a hand portion at one end thereof to secure the respective bracket to the vehicle body, each hand portion having a main
20 hand element and a thumb element arranged in an angular relationship with respect to one another for securing the bracket to complimentary angularly arranged surfaces on the vehicle body.

Preferably, both arms of each bracket has a hand portion at an end thereof.

Each bracket may be made from a single piece of thin sheet material formed to produce the desired collapse characteristics.

Each of the deformable sections may have a depression formed therein.

At least one flange may be formed along longitudinally extending edge of each
5 deformable section.

One of the deformable sections may have flanges on both of its longitudinally extending edges.

Each of said first and second connecting means may include a rigid member interposed between the respective end of the handle and the respective bracket to
10 transfer any impact loads applied to the handle to the deformable sections of the brackets.

Preferably, the length of each rigid member may be at least as long as the length of the central portion of the bracket against which it abuts.

Advantageously, the rigid member may be adapted to form part of the connection
15 between the respective end of the handle and the respective bracket.

Brief Description of Drawings

The invention will now be described by way of example with reference to the accompanying drawings in which:-

Fig.1 is a side view of part of an interior of a motor vehicle showing a
20 handle assembly according to the invention;

Fig.2 is a schematic cross-section on the line R-R on Fig.1;

- Fig.3 is a pictorial representation of a handle assembly according to the invention secured to part of the body structure of the motor vehicle;
- Fig.4 is a pictorial representation of a second bracket forming part of the handle assembly shown in Fig.3;
- 5 Fig.5 is a cross-section on the line B-B on Fig.4;
- Fig.6 is a plan view of the bracket in the direction of arrow P on Fig.4;
- Fig.7 is a pictorial representation of a snap connector forming part of the handle assembly shown in Fig.3;
- Fig.8 is a pictorial representation of a rigid member forming part of the handle assembly shown in Fig.3;
- 10 Fig.9 is an end view of a rigid member in the direction of arrow E on Fig.8;
- Fig.10 is a pictorial view of a bezel member forming part of the handle assembly shown in Fig.3;
- Fig.11 is a pictorial view of a handle forming part the handle assembly shown in Fig.3;and
- 15 Fig.12 is a scrap view of one end of the handle assembly shown in Fig.3 showing in close up the means of connecting the handle to the bracket.

Description of Preferred Embodiment

With particular reference to Fig.1 there is shown part of the interior of a motor vehicle 1 having a door 2 and a body structure defining a door aperture 3.

A grab handle assembly 10 is secured by spot welding to a roof beam 7 as shown in Fig.2. The roof beam 7 is concealed behind a roof trim member in the form of a headliner 5. The headliner 5 has an aperture 6 through which a bezel member 29a extends. A curtain airbag assembly (not shown) extends along the length of the vehicle roof just above the door aperture 3 and is concealed from view by a trim member 4.

With particular reference to Fig.2 the bracket assembly 10 has a first bracket 14 is spot welded at locations 8a, 8b to two angularly arranged surfaces 9a, 9b of the roof beam 7. One of the surfaces 9a lies on a plane Y-Y and the other of the surfaces 9b lies on a plane X-X. The planes Y-Y and X-X are angularly arranged at an angle Z with respect to one another forming angularly arranged surfaces.

With particular reference to Fig.3 the handle assembly 10 is shown in greater detail. The handle assembly 10 comprises first and second brackets 14, 15 attached to the angularly arranged surfaces 9a, 9b forming part of the body structure of the motor vehicle and a handle 11 having first and second ends 11a, 11b each of which is pivotally connected to a respective one of the brackets 14, 15 by means of a respective connecting means 32a, 32b.

A first connecting means 32a is arranged to connect the first end 11a of the handle 11 to the first bracket 14 and a second connecting means 32b is arranged to connect the second end 11b of the handle 11 to the second bracket 15.

The first connecting means 32a has the bezel member 29a pivotally connected to the first end 11a of the handle 11, a rigid member 31a interposed between the bezel

member 29a and the first bracket 14 and a snap connector 30a interengaged with a T-shaped recess 33a.

The second connecting means 32b has a bezel member 29b pivotally connected to the second end 11b of the handle 11, a rigid member 31b interposed between the
5 bezel member 29b and the second bracket 14 and a snap connector 30b interengaged with a T-shaped recess 33b.

As can be seen the first bracket 14 and the first connecting means 32a are substantially the same as the second bracket 15 and the second connecting means 32b. The following description in relation to the second bracket and connecting means
10 15 and 32b is equally applicable to the first bracket and connecting means 14 and 32a.

As is best seen in Figs 4 to 6 the second bracket 15 is substantially U-shaped and has a first arm 16 and a second arm 17 joined together by a substantially flat central portion 27. The first arm 16 has a deformable portion 18a extending away from the central portion 27 and a hand portion 19a at a free end thereof used to connect the
15 bracket 15, in use, to part of the body structure of the motor vehicle.

The hand portion 19a has a main hand element 20a which extends from end of the deformable portion 18a and a thumb element 21a which extends from one edge of the main hand element 20a. The main and thumb elements 20a and 21a are used to secure the bracket 15 to part of the body structure of the motor vehicle and are
20 arranged at an angle with respect to one another for co-operation in use with the angularly arranged surfaces 9a, 9b to which they are secured by spot welding.

This method of attachment to the body structure ensures that there is no intrusion into the cavity defined by the roof beam 7 which is important if the cavity is used to store an airbag. However, it will be appreciated that other methods of surface

attachment such as brazing or adhesive bonding could be used without departing from the spirit of the invention.

By arranging the thumbs and main hand elements 21a, 21b and 20a, 20b in an angular relationship with respect to one another, a very stable of means of attachment
5 of the bracket 15 to the motor vehicle is provided. The bracket 15 is stable longitudinally, laterally and vertically in comparison with a situation in which a bracket is secured only against one flat surface. In addition, the welds between the main hand elements 20a, 20b tend to be subject to shear forces, while the welds between the thumb elements 21a, 21b tend to be subject to peel deformation.

10 The second arm 17 also has a deformable portion 18b extending away from the central portion 27 and a hand portion 19b at a free end thereof used to connect the bracket 15, in use, to part of the body structure of the motor vehicle.

The hand portion 19b has a main hand element 20b which extends from one end of the deformable portion 18b and a thumb element 21b which extends from one edge
15 of the main hand element 20b. The main and thumb elements 20b and 21b are used to secure the bracket 15 to part of the body structure of the motor vehicle and are arranged at an angle with respect to one another for co-operation, in use, with the angularly arranged surfaces 9a, 9b to which they are secured by spot welding.

The bracket 15 is made from a single piece of sheet steel of approximate
20 thickness 1mm. Such a thickness allows the the material to be flexible enough to be formed by pressing and swaging into the complex shape necessary to form the bracket 15 but when correctly formed offers sufficient strength to secure the handle 11 to the motor vehicle for use as a grab handle.

To provide the bracket 15 with the required deformation properties each of the deformable sections 18a, 18b has a depression 22, 23 formed therein. The depression 22 formed in the deformable section 18a of the first arm 16, when viewed from inside the bracket 15, is concave throughout its length. However, the depression 23 formed in the deformable section of the second arm 17 is, when viewed from inside the bracket 15, concave near the juncture with the central portion 27 but convex at its juncture with the hand portion 19b. This is because the depression 23 in the second arm 17 extends around the outer surface of the curved portion of the arm 17 into the hand portion 19b and it is difficult to produce a concave depression in the region. The depth of each of the depressions 22, 23 is variable along its length but each of the depressions has a maximum depth of 5mm.

To increase the resistance to bending and torsional loads flanges are formed along the longitudinally extending edges of the deformable sections 18a, 18b.

A second flange 24 is formed along the longitudinally extending edge of the bracket 15 between the first thumb element 21a and the second thumb element 21b thereby strengthening the central portion 27 and both of the deformable sections 18a, 18b.

A second flange 24 is swaged upwardly along one edge of the central portion 27 to improve the resistance to bending of this portion.

It will be appreciated that the deformation response of the bracket can be altered significantly by altering the length and depth of the swaged flanges 24, 25.

A third flange 26 extends downwardly from one longitudinally extending edge of the deformable section 18b of the second arm 17. By providing the deformable section 18b of the second arm 17 with flanges on both of its longitudinally extending edges the

second arm 17 is further strengthened which encourages the bracket 15 to collapse initially by buckling and bending of the first arm 16. This provides a more predictable and controlled deformation of the bracket 15.

In order to maximise the performance of the bracket 15 any impact load applied to
5 the bracket 15 is spread or diffused across the central portion 27 to prevent uncontrolled deformation or piercing of the central portion 27. To achieve this the connecting means 32b includes a load spreading means in the form of the rigid member 31b.

The rigid member is in the form of a flat plate 31b defining therein a T-shaped
10 recess 33b and is approximately 42mm in length, 5mm in thickness and is cast from a zinc alloy material to produce a stiff but lightweight component.

The T-shaped recess is used to connect the snap connector 30b to the flat plate 31b. The snap connector 30b is made made from spring steel and has a flat base portion 34 for engagement with the T-shaped recess 31b and resilient arms 35 for
15 engagement with an aperture 39 in the central portion 27 used to attach the snap connector 30b to the bracket 15. Such snap connectors are well known in the art and will not be described in greater detail.

The flat plate 31b has a threaded aperture 40 for co-operation with a threaded fastener (not shown) used to connect the flat plate 31b to the bezel member 29b. The
20 bezel member 29b has a corresponding aperture 36 formed therein through which the threaded fastener extends for engagement with the flat plate 31b.

The bezel member 29b is moulded from a plastics material and has a large peripherally extending flange 42 to cover the aperture 6 in the headliner 5.

To ensure that the majority of any impact load is transferred into the deformable sections 18a, 18b and not into the central portion 27 the flat plate 31b is longer than the length of the central portion 27. This ensures that when a load is applied to the handle 11 or the bezel 29b the load is spread across the central portion 27 and in practice is
5 transferred directly into the first and second arms 16, 17. In this way the collapse properties of the bracket 15 are determined primarily by the strength and deformability of the deformable sections 18a, 18b irrespective of the location or direction of the impact load.

Although the rigid member as described above forms an integral part of the
10 connecting means used to secure the handle to the two brackets it will be appreciated that each rigid member could be merely a spacer interposed between the handle and the respective bracket.

CLAIMS

1. A handle assembly secured to part of a body structure of a motor vehicle for assisting the ingress and egress of a person entering or exiting the motor vehicle comprising a handle having first and second ends, first and second brackets securable to the body structure to space the handle away from said body structure, a first connecting means to connect the first end of the handle to said first bracket and a second connecting means to connect the second end of the handle to the second bracket wherein each of said first and second brackets is substantially U-shaped having two arms connected by a central portion, each arm having a deformable section arranged to collapse in a controlled manner upon the application of an impact load to the handle.
2. A handle assembly as claimed in Claim 1 in which at least one of the arms has a hand portion at one end thereof to secure the respective bracket to the vehicle body, each hand portion having a main hand element and a thumb element arranged in an angular relationship with respect to one another for securing the bracket to complimentary angularly arranged surfaces on the vehicle body.
3. A handle assembly as claimed in Claim 2 in which both arms of each bracket has a hand portion at an end thereof.
4. A handle assembly as claimed in any of Claims 1 to 3 in which each bracket is made from a single piece of thin sheet material formed to produce the desired collapse characteristics.
5. A handle assembly as claimed in any preceding claim in which each of the deformable sections has a depression formed therein.

6. A handle assembly as claimed in any preceding claim in which at least one flange is formed along a longitudinally extending edge of each deformable section.
7. A handle assembly as claimed in Claim 6 in which one of the deformable sections has flanges formed on both of its longitudinally extending edges.
8. A handle assembly as claimed in any preceding claim in which each of said first and second connecting means includes a rigid member interposed between the respective end of the handle and the respective bracket to transfer any impact loads applied to the handle to the deformable sections of the brackets.
9. A handle assembly as claimed in Claim 8 in which the length of each rigid member is at least as long as the length of the central portion of the bracket against which it abuts.
10. A handle assembly as claimed in Claim 8 or in Claim 9 in which the rigid member is adapted to form part of the connection between the respective end of the handle and the respective bracket.
11. A handle assembly substantially as described herein with reference to the accompanying drawings.



Application No: GB 0027721.0
Claims searched: 1-11

Examiner: Kevin Hewitt
Date of search: 16 February 2001

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B7B (BAA, BSDB)

Int Cl (Ed.7): B60N 3/02; B60R 21/055

Other: Online WPI, EPODOC, JAPIO.

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0852191 A1 (TOYOTA) Whole document relevant, especially Figs. 1, 6, 8A and 9.	1-4,6,8-10
X	EP 0800956 A1 (TOYOTA) See Figs. 2, 4 and 5.	1,4,5,8-10

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.